

Bacteriological Quality of Frozen Desserts Available in Retail Markets of Namakkal District, Tamil Nadu, India

K.A. Doraisamy¹, A. Elango², V. Jayalalitha³ and T.R. Pugazhenth⁴

¹Dean, Veterinary College and Research Institute, Namakkal, Tamil Nadu, India

²Professor and Head, Department of Dairy Science, Veterinary College and Research Institute, Namakkal, Tamil Nadu, India

³Assistant Professor, Veterinary University Training and Research Centre, Tiruchirapalli, India

⁴Associate Professor, College of Food and Dairy Technology, Koduveli, Chennai, India

Corresponding author: elangodsc@gmail.com

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ABSTRACT

Forty samples (10 kulfi, 10 branded ice cream, 10 softy ice cream and 10 ice milk) were subjected to standard plate count, coliform, salmonella and *Staphylococcus aureus* count. The mean standard plate count for kulfi, ice cream, softy and ice milk, were 3.723 ± 0.125 , 1.277 ± 0.128 , 4.277 ± 0.112 and 5.667 ± 1.410 respectively. The coliform and salmonella were negative in branded ice cream samples. A total of 7 samples of kulfi, ice milk and softy ice cream showed positive for *staphylococcus aureus*. Since the bacteriological quality of frozen dessert are poor in the study area, precautionary measures have to be taken in production as well as post-production period up to the consuming in order to prevent food poisoning.

Highlights

- The bacteriological quality of frozen desserts and their safety for human consumption are dependent entirely on the hygienic manufacturing and handling process.
- The bacteriological quality of most of the softy ice cream, kulfi and ice milk needs to be improved in order to prevent any food poisoning.
- Good manufacturing practice (GMP) would be a good way to improve the hygienic quality of softy ice-cream, especially in all steps after pasteurization.

Keywords: Ice cream, kulfi, ice milk, softy ice cream, SPC, *Staphylococcus aureus*, coliform

Frozen desserts are always preferable in Indian cuisine. They are rich source of nutrients and subjected to microbial contamination at various stages of manufacture and during addition of ingredients. Kulfi is a popular South Asian ice cream made with boiled milk typically from water buffalo. Kulfi differs from western ice cream in that it is richer in taste and creamier in texture. Milk based products are good media for microbial growth due to high nutrient value, almost neutral pH value and long storage duration. Primary sources of microbial contamination to ice cream include water and raw milk whereas secondary sources include flavoring agents, utensils and handling. Although pasteurization and freezing steps in production

can estimate most of the microbial hazards, but still numerous health hazards are persistent due to various conditions. The handling by the operators who happen to be the carrier of certain diseases may also contaminate the product with potential pathogenic organisms.

To ensure the safety of the product, bacteriological quality of frozen dessert should be as high as possible and it must be free from pathogens. With this background, this present study is conducted to determine the bacteriological quality of commercially available frozen dessert viz., kulfi, ice cream, softy ice cream and ice milk in Namakkal district, Tamil Nadu in India.



MATERIALS AND METHODS

Forty samples inclusive of 10 kulfi, 10 branded ice cream, 10 softy ice cream and 10 ice milk were purchased from different retails markets in Namakkal district. The collected frozen dessert was considered as a single representative sample. From this thoroughly mixed sample, an exact quantity of 1 ml of sample was pipetted out aseptically and transferred into a sterile empty test tube and plugged with cotton. To this sample 9 ml of dilution was added to give a 1:10 dilution v/v. Further, decimal dilution as required was prepared according to standard method given by APHA (1960).

Standard plate count, coliform count were estimated as per standard methods for examination of Dairy products (I.S. No. 1479, part III (1977). Staphylococcus agar No.110 was used to enumerate Staphylococcus species.. Detection of Salmonella by initial enrichment with Selenite F broth and plated with Brilliant Green Agar. Typical colonies were selected and confirmed with biochemical reactions (Barrow and Feltham, 1993).

RESULTS AND DISCUSSION

The bacteriological quality of the kulfi, ice cream, softy ice cream and ice milk samples are presented in Table 1.

The mean SPC for kulfi, Ice cream, softy and lollies, were 3.723 ± 0.125 , 1.277 ± 0.128 , 4.277 ± 0.112 and 5.667 ± 1.410 log cfu/g respectively. All analyzed frozen dessert samples (n=40) showed positive growth on plate count agar indicating the presence of psychrophilic microorganisms. Ambily and Beena, 2012 reported that total viable count of ice cream samples from branded and street vendors were 1.2×10^2 to 8.2×10^3 CFU/g and 5.2×10^5 to 6.6×10^6 CFU/g respectively. Kumar *et al.* (2011) reported

heavy contamination in ice cream from street shops in Jalandar city, Punjab bacterial count ranged from 0.1×10^9 CFU/g to 10.2×10^9 CFU/g

The coliform was absent in branded ice cream samples. Whereas in kulfi, softy ice creams and ice milk ranged from 0 to 2.301, 1.301-2.698, and 2.301-2.698 cfu/gm respectively. The Coliform standards for ice cream should not over 10/ml (Frazier 1958 and James 1978). However, as per the FSSAI a coliform count of ice cream should not be more than 100 per gram. Most of the samples had a coliform count of less than 90 per gram. But few samples of had a higher than the prescribed limit. In the year 2012, more than 30% of the ice cream samples showed beyond the coliform limit (Ambili and Beena 2012).

Salmonella was not detected in any of the branded ice cream and kulfi samples. Only two samples from softy ice cream and ice milk showed positive for salmonella. It should be absent in 25 g as per the standards. This result indicates that consumption of softy ice cream and ice milk is totally unsafe and needs to be handled with appropriate measures to avoid contamination.

Staphylococcus aureus was identified from 7 samples of kulfi, softy ice cream and ice milk. According to Warke *et al.* (2000), presence of *S. aureus* in all ice cream samples sold in some retail outlets in Mumbai, India. Joshi *et al.* (2000) found that *Staphylococcus aureus* can survive better in frozen dairy products can elaborate enterotoxin leading to food poisoning outbreaks. Hobbs and Golbert (1982) reported that the possible source(s) of this organism in ice cream could be from nose where it is commonly found hands, skin and clothing of handlers. Coughing, talking and sneezing produce droplets which could settle on ice cream during transportation, storage and handling.

Table 1: Bacteriological quality of frozen desserts obtained from different sources

Sl. No.	Count	Kulfi	Ice Cream	Softy ice cream	Ice milk
1	Standard plate count (SPC) (log CFU/g)	3.723 ± 0.125	1.277 ± 0.128	4.277 ± 0.112	5.667 ± 1.410
2	Coliforms (log CFU/g)	1.217 ± 0.015	ABSENT	1.817 ± 0.026	2.221 ± 0.025
3	Salmonella (number of samples identified positive)	0	0	1	1
4	<i>Staphylococcus aureus</i> (number of samples identified positive)	2	0	2	3



The presence of coagulase positive *Staphylococcus*, which is mainly *S. aureus* when transmitted from man and animal, can lead to staphylococcal food poisoning as a result of growth of the organism and release of enterotoxin in the food. Enterotoxin production and secretion occurs especially when ice cream products are not properly prepared and stored. The presence of starch and proteins also encourages enterotoxin production by microorganisms (Jay 1992).

The richness in nutritive constituents of ice cream although has been realized by all but the problem lies in the production and handling of this food is very complex one and is associated with so many problems. So, there are great difficulties in regards to quality and quality of ice cream and microbiological quality of ice cream is also far from satisfactory. At many points, during production, transportation, storage and preparation milk food for consumption, it may become contaminated with biological agents. The biological agents contaminated with in food are traced to ingredients added post pasteurization and environmental factors such as air, faults in storage tank, cracks in the plant and packaging materials (Bigalke and Chappel 1984).

From the above findings, it was revealed that all branded ice cream samples were within acceptable limit of public health safety because the samples did not exceed the total viable count of 2,50,000 and coliform count of 90 per gram as prescribed by the Bureau of Indian Standards. It is clear from the overall results that all the ice cream samples were of safe. It is also obvious that few of the kulfi and majority of the softy ice cream and ice milk were unsafe for consumption as it harbours salmonella staphylococcal organisms.

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